REMARKS/ARGUMENT

Applicant responds herein to the Office Action dated March 20, 2002. A Petition for Extension of Time (three months) and the fee therefor are enclosed.

Responsive to paragraph 1 of the Office Action, the priority document should have been transmitted by the international bureau with all the PCT application papers.

Responsive to the objection to claim 1, based on the usage of "disbursed layer", the objection has been mooted by the amendments to the claims herein.

Indeed, the applicant has carefully reviewed the specification and has noted the necessity of entering additional typographical corrections in the specification which are submitted not to introduce any new matter. Accordingly, the Examiner is respectfully requested to review, approve and enter the amendments to the specification herein.

Further in response to the objections to the specification that are set forth at the bottom paragraph on page 2 of the Office Action, please note the following. The present invention relates to an apparatus and method capable of continuously producing DC electromotive force which is converted from ambient temperature of the apparatus in a thermal equilibrium state as claimed in the newly presented claim 1. This conversion from heat to DC electromotive force possibly happens when special conditions are met, which special conditions are defined with specificity in claims 1, 9 and 10.

These claims 1-3 and 5-9 are reproduced below, in each case indicating the support for the claimed elements in the specification.

1. An apparatus, comprising:

a collector electrode of conductive material; *[support of this feature can be found on page 35 line 11-13, page 36 lines 3-4 and FIG. 1.]*

a first charge movement barrier layer electrically contacted with said collector electrode; *[support of this feature can be found on page 35 line 11-13, page 36, lines 3-4 and FIG. 1.]*

a nano-particles layer in which with being insulated with each others, a plurality of conductive and of a predetermined minute size of nano-particles are arranged as a mono layer to have electrical contacts with said first charge

movement barrier layer; *[supports of these features can be found on page 4 lines 13-16; page 25 lines 10-15; page 35 line 13-15; page 36 lines 3-6; and FIG. 1.]*

a first semiconductor layer contacted with said nano-particles through the medium of a rectifying barrier with a predetermined depth; and *[support of this feature can be found on page 35 lines 13-20; page 36 lines 6-7; and Fig. 1.]*

a source electrode of conductive material electrically contacted with said first semiconductor layer, *[support of this feature can be found on page 36 lines 7-8; page 42 line 13; and Fig. 1.]*

wherein a plurality of nano-sized rectifying devices formed by said first nano-particles layer and said first semiconductor layer have electrical connections in parallel with said collector electrode through said first charge movement barrier, each of said rectifying devices taking a role as an electrically dependent rectifying device, and *[supports of these features can be found on page 2 line 13 – page 3 line 6; page 3 lines 16-19; page 4 lines 13-16; page 23 line 6 - page 26 line 2; page 35 lines 11-20; and Fig. 1.]*

wherein by means of a phenomenon, by unit charge (1.602×10^{-19}C) coming in and out said nano-particles and confined by a barrier, of generating irregular AC potential by heat on respective said nano-particles, ambient temperature of said apparatus in a thermal equilibrium state is converted by itself so that said apparatus continuously produces DC electromotive force. *[supports of these features can be found on page 4 lines 6-21; page 7 line 16 – page 8 line 7; page 8 lines 17-22; page 23 line 6 - page 26 line 2; and page 40 lines 14-22.]*

2. The apparatus of claim 1, wherein said collector electrode, said source electrode and said nano-particles are made of metal or its equivalent material, respectively. *[support of claim 2 can be found on page 35, lines 13-15 and page 36 lines 3-8.]*

3. The apparatus of claim 1, wherein said first semiconductor layer is either P-type semiconductor. [*support of claim 3 can be found on page 35, lines 17-18.]*

5. The apparatus of claim 1, further comprising a second nano-particles layer equivalent with said first nano-particles layer and a second semiconductor layer of which carrier type is opposite to that of said first semiconductor layer are inserted between said first charge movement barrier layer and said collector electrode, so that said apparatus has P-type and N-type conductive structures sharing said first charge movement barrier layer, connected serially with each other, and between said collector electrode and said source electrode. *[support of claim 5 is the expression "in designing P-type and N-type serially" which can be found on page 35, line 8; and page 42 line 12-13.]*

6. The apparatus of claim 1, further comprising a second semiconductor layer of which carrier type is opposite to that of said first semiconductor layer is inserted between said first charge movement barrier layer and said collector electrode, so that said apparatus has P-type and N-type conductive structures which shares said first nano-particles layer and are connected serially with each other. *[support of claim 6 is the expression "in dispersing metal particles contacting both P-N junction" which can be found on page 35, lines 7-8; and page 42 line 11.]*

7. The apparatus of claim 1, further comprising an ohmic layer between said first semiconductor layer and said source electrode. *[support of claim 7 can be found on page 35, lines 20-21; and Fig. 1.]*

8. The apparatus of claim 1, wherein said first charge movement barrier layer is made from material capable of providing tunneling effect or resistor material so as to prevent said plurality of nano-particles from having direct electrical connections with each others through said collector electrode. *[support of claim 8 can be found on page 35, lines 11-13.]*

9. The apparatus of claim 1, wherein said first charge movement barrier layer has incomplete conductive state with both barrier property and

conduction property, said barrier property preventing said plurality of nano-particles from having direct electrical connections with each others through said collector electrode and attributing to generation of the irregular AC potential on respective nano-particles which the unit charge comes in and out, and said conduction property allowing said rectifying devices to have electrical connections in parallel with said collector electrode through said first charge movement barrier. *[supports of these features can be found on page 4 lines 6-21; page 7 line 16 – page 8 line 7; page 23 line 6 - page 26 line 2; and page 35 lines 11-20]*

10. A method of obtaining a desired DC electromotive force, by using said apparatus of claim 1, and by allowing, at an ambient temperature of said apparatus, among unit charges, only the unit charges with such as high energy by which they can go over a barrier determined by carrier density of said first semiconductor layer, size (being able to be represented as area S) of said nano-particles, depth L1 of said charge movement barrier layer, and depth L2 of said rectifying barriers, so as to generate irregular AC potential on said nano-particles. *[supports of these features can be found on page 3 lines 2-6; page 23 line 6 - page 26 line 2; and page 40 line 7 – page 41 line 13.]*

Particularly, when depth L1 of first charge movement barrier layer, depth L2 of the rectifying barrier which intervenes between the first semiconductor layer and the nano-particle layer, and the size S of respective nano-particles are suitably designed, a phenomenon of, so-called, thermal fluctuation, which is caused by unit charges, for example, of electrons (1.602×10^{-19}C) coming in and out the nano-particles and confined by a barrier, serves to generate irregular AC potential by heat on said respective nano-particles (refer to claim 1). All the unit charges cannot always generate thermal fluctuation. The unit charge capable of generating thermal fluctuation is required to have higher energy capable of going over a barrier determined by particular values of L1, L2 and S (refer to claim 9). Of course, when the barrier becomes higher, the number capable of going over the barrier is reduced. If the barrier is so raised that the electron capable of causing the thermal fluctuation remains only one per one nano-particle within a rectifiable period (please

note that it is known that a semiconductor rectifying device its own rectifiable upper limit frequency), which is the condition that simultaneous probability is zero, a desired thermal fluctuation can happen. The one electron is the electron that has the maximum energy within the rectifiable period and can which generate the desired high potential on the nano-particle. This phenomenon can arise in a thermal equilibrium state and the energy of the one electron is originated from the ambient temperature of the apparatus.

Responsive to the Examiner's comments that:

> "Applicant's statement that his invention contradicts the second law of thermodynamics and the rectifying function of the device as being able to operate without supply of energy are unsubstantiated, considering the absence of a plot of entropy as a function of time or the equivalent of it. Applicant should provide that plot in a manner that enables a straightforward verification of said statement or ...."

it is noted respectfully as follows:

Firstly, the patent specification statements about the second law of thermodynamics are not intended to say that the second law of the thermodynamics is not true or to deny the law but to say that the law cannot be used to reasonably and completely explain the phenomenon of the present invention. The present invention is based on finding a particular phenomenon of the nano-scale microscopic world summarized as above. However, it is impossible to understand and explain the phenomenon by the second law of thermodynamics. Accordingly, the applicant established a new theory, a "simultaneous theory", as a method or a tool to understand and explain the particular phenomenon and uses the simultaneous theory for the explanation of the feasibility of the present invention, rather than have to involve the second law of thermodynamics.

Regarding the examiner's request: "Applicant should provide that plot (of entropy as a function of time) in a manner that enables a straightforward verification of said statement or ...", applicant deems the request as an improper and unreasonable demand upon the applicant if only one way, that is, the plot of entropy as a function of time, is allowed to the applicant as an explanation method or tool for proving the correctness of the invention and its operability. The applicant does not know how and has not the knowledge to explain the subject matter of the present invention by means of a plot of entropy as a function of time based on the second law of thermodynamics. The applicant believes that the best and more effective way for eliminating the

examiner's doubts on the substantiation and enablement of the present invention is to demonstrate the possibility of energy conversion with the apparatus of the present invention. For this, the applicant is engaged in building a prototype apparatus of the present invention, to obtain verifiable data relating to the present invention so as to prove that the present invention is operable. It is anticipated that the applicant can complete the making of the prototype apparatus and obtain the verifiable data no later than the end of this year, 2002.

For the purpose of accrediting and substantiating and prove the enablement of the present invention, the applicant also plans to acquire a certification from a public R&D institution or organization of Korea of the to be tendered data. As soon as the verifiable data and the certification thereof shall be obtained, the applicant will submit them as a supplemental response and as an indirect demonstration of the present invention. If any other direct demonstration of the present invention is demanded for overcoming the rejection reasons, the applicant is willing to meet such demands.

To permit the proper and due consideration of Applicant's further submission, the Applicant is submitting herewith a Petition unde 37 C.F.R. §1.103(a) for a suspension of action.

Further and responsive to the examiner's statement: " ... the rectifying function of the device as being able to operate without supply of energy ...", the applicant wonders whether the examiner properly understands that the specification states that the present invention is inconsistent with the energy conservation law. The applicant has never stated that the present invention contradicts the energy conservation law. The expression "without supply of energy" on lines 7-8 of page 4 or the like should be understood as the expression "without a low temperature heat source". Support of this can be the expression "...a conversion of thermal energy into electric energy without a low temperature heat source is accomplished." as recited on lines 8-10 of page 2 of the specification.

Based on the foregoing, the applicant traverses the objection to the specification on the grounds noted. Indeed, the objection to the originally submitted claims as set forth in paragraph 4 of the Office Action, on the basis of 35 U.S.C. §112, first paragraph, is similarly traversed for the reasons noted above. Similar remarks are also applicable to the rejection of all of the claims under 35 U.S.C. §101, since the applicant does not contend or purport that the second law of thermodynamics is incorrect or has been disproven. Rather, the applicant's

contention is that the apparatus that he has invented operates under a different principle of law, which is not specifically concerned with the second law of thermodynamics, which deals with heat engines and/or which has been explained by one commentator by stating: "It is impossible for a heat engine that operates in a cycle to convert its heat input completely into work."

Turning to the rejection on prior art, specifically of claim 1, as originally presented, as being anticipated by Schoch, Jr., et al. (5,250,388) and claims 2 and 3 as being obvious over Schoch, Jr., et al. in view of Goronkin, et al. (5,049,951), as set forth at paragraph 9 of the Office Action, it is respectfully noted that the claims, as amended, present and define new technical features and elements of the apparatus that are not at all addressed in the present Office Action, nor recognized or disclosed or rendered obvious by the citations of record. Therefore, the claims of record comply both with the dictates of 35 U.S.C. §112, and also constitute inventions that are both novel and unobvious over the cited prior art.

Accordingly, the Examiner is respectfully requested to reconsider the application, allow the claims as amended and pass this case to issue.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Asst. Commissioner for Patents, Washington, D.C. 20231, on September 20, 2002

Max Moskowitz
Name of applicant, assignee or Registered Representative

Signature

September 20, 2002
Date of Signature

Respectfully submitted,

Max Moskowitz
Registration No.: 30,576
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700

APPENDIX A

"CLEAN" VERSION OF EACH PARAGRAPH/SECTION/CLAIM
37 C.F.R. § 1.121(b)(ii) AND (c)(i)

SPECIFICATION:

Replacement for the paragraph beginning at page 4, line 22:

There's no prior art in this field, and the accomplishment of the present invention contradicts the second law of thermodynamics. It is anticipated that very few scholars in the field will deny the second law of thermodynamics.

Replacement for the paragraph beginning at page 8, line 8:

6. In a battery having one electrode made of copper plate coated with copper sulfide, the other electrode made of copper plate and an electrolyte of copper(II) sulfate, the copper plate becomes positive(+) electrode. Copper is precipitated during discharging and copper particles grow on the negative electrode at the portion where the copper plate is exposed, without a supply of external power. After implementing various methods, it was found that the surface of copper sulfide is positive(+) electrode and an inner portion of copper sulfide contacting the copper plate is a generator of a negative electrode and the copper plate of the negative electrode is a mere metal plate contacting the generator. The electrolysis of copper at both electrodes is implemented by the electromotive power outputted from the generator. The present inventor found that the outputted energy was originated from the rectifying phenomenon of thermally moving electrons. By utilizing this apparatus, a temperature drop at the portion where the electromotive force was generated, could be detected. Further, the conversion of heat of an object into electric energy by the rectifying method utilizing the thermally moving electrons can be verified.

Replacement for the paragraph beginning at page 9, line 20:

The relationship of the electromotive force to the size of the metal particles and the problem of non-reproductiveness of the voltage value were solved only in the electrolyte and water. Although some problems of interference of the chemical electromotive force occur for these cases, the relationship of the size of the minute metal particles to the amount of the current can be obtained. In addition, the size of the metal particles can be controlled while reading the

values of the electromotive force. There's other various advantages accompanying the experiments in the electrolyte or water. Different from the experiments implemented in the vacuum or under atmosphere, the electrolyte or water becomes a barrier layer in this experiment.

Replacement for the paragraph beginning at page 11, line 6:

The copper sulfide electrode was replaced with an electrolyte manufactured by the following method. Cu was deposited in a vacuum on the surface of Ta metal plate. Then, thus obtained metal plate was immersed into an aqueous $CuSO_4$ solution for electroplating copper onto the surface to obtain about 0.02mm thick copper layer. After rinsing with water, the copper coated plate was impregnated with $(NH_4)_2S_x$ solution for 5 minutes to change copper into copper sulfide. Thus obtained sample was replaced with the copper sulfide electrode of the previously described battery. As a result, almost similar value of the electromotive force was obtained. When copper sulfide was employed as an anode and an electroplating with a relatively low current of $50mA/12cm^2$ for 60 seconds was carried out to form minute metal particles on the surface of copper sulfide, the voltage increased. Various experiments utilizing this battery were implemented as follows. A reverse current was provided to extinguish the metal particles.

Replacement for the paragraph beginning at page 16, line 14:

1. Even though a surface of water of an isolated lake makes rippling waves, mean water level of the lake is considered to be same and the lake is considered to be in equilibrium. Through the whole lake, the amount of water above an absolute horizontal plane and that below the absolute horizontal plane are same and the water above and below the horizontal plane are in equilibrium. When a molecule of water ascends above the horizontal plane, another molecule of water descends below the horizontal plane at some other place in the lake. Thus, the water level is kept constant. However, when the surface is divided and observed, and a surface having a peak of the wave is observed, a heap of water ascends without having the same amount of water descend in this divided area. That is, the peak and trough of a wave are not always present in one space. This space has simultaneous probability of zero (0/1). Even though the lake is collectively in equilibrium, a local portion which is not in equilibrium is present. When the space of the local portion is enlarged, this portion approaches to the equilibrium state.

Replacement for the paragraph beginning at page 17, line 6:

2. A seawater level on the earth has a constant mean water level because the amount of water evaporating and precipitating is the same. When the seawater keeps the mean water level, the two amounts are the same and the state of equilibrium is maintained. However, at some places, the amount of water evaporated is larger and at some places, a heavy rainfall pours. At an entrance of a river, a large amount of water inflows. That is, even though the seawater is collectively in equilibrium, each portions are not in equilibrium.

Replacement for the paragraph beginning at page 18, line 6:

For example, when a metal and a semiconductor contact to form a rectifying surface and a voltage is not applied, an exchange of electrons occurs only for an instant and an equilibrium state is achieved after metal and semiconductor establish Fermi level. At this time, the number of electrons coming in and out of the rectifying surface is the same and no resulting voltage change is obtained. The voltage between two terminals of the boundary surface is called a contacting electricity which is generated by both materials and not discharged. This rectifying surface is in equilibrium and does no work with respect to an external system.

Replacement for the paragraph beginning at page 19, line 14:

Thus, when indefinite amount of particles are present in a space, the simultaneous theory and the second law of thermodynamics render the same result. However, when the number of particles present in the space is limited, the simultaneous theory and the second law of thermodynamics give completely different result. Accordingly, the one which closely corresponds to the actual reality gives an accurate result. When the rectifying surface is large and countless free carriers are present at the surface, the system is in equilibrium by both theories.

Replacement for the paragraph beginning at page 22, line 4:

a9 It is difficult to describe the operational principle of the rectifying surface. The above-described phenomenon is obtained when there are a small number of electrons.

Replacement for the paragraph beginning at page 24, line 21:

When the simultaneous theory is supposed to be true, an irregular alternating potential is generated by electrons entering and exiting a minute rectifying surface. This generation is originated from the kinetic energy of electrons by heat. The rectifying phenomenon is accomplished when the rectifying condition is satisfied. The rectifying phenomenon occurs when there is a difference of electrons entering and exiting the rectifying surface which is caused by a heightened barrier by an externally applied voltage and a low barrier of forward direction. The a10 rectifying condition is an externally applied voltage. When a minute rectifying surface is allowed, a current amount will be very weak. A plurality of minute rectifying surfaces arranged in parallel will give the same effect with a rectifying surface having one large area. At this time, the rectifying phenomenon of the thermally moving electrons does not occur by the simultaneous theory. However, when minute metal particles are dispersed on a surface of a semiconductor, and when each particle is electrically insulated, each particle maintains its own independent rectifying reaction. A number of metal rectifying particles are connected with a collecting metal surface with a tunneling effect layer (in the experiments, tantalum oxide layer, aluminum oxide layer or water was utilized) between them. Then, the particles are combined in parallel to accomplish a large rectifying surface of which rectifying condition by the simultaneous theory is satisfied. The minute metal particles have irregular phases and periods. However, the rectifying direction of the semiconductor and the metal particles are the same. Thus, an effective rectifying reaction is implemented and about 20 Amperes per cm^2 or above of current could be obtained with rough experimental apparatuses. The resistance of the semiconductor has been disregarded. The collecting metal surface contacts the semiconductor where the metal particles are not present with the tunneling effect layer between them. However, no discharging occurs because a reverse direction is obtained with respect to the semiconductor owing to the rectifying structure.

Replacement for the paragraph beginning at page 26, line 5:

As described above, when the rectifying surface is divided into minute regions, an aggregate of minute rectifying surfaces in non-equilibrium state is obtained. The minute rectifying surfaces have the simultaneous probability of zero (0/1). When independent rectifying apparatus is installed for each rectifying surfaces, energy can be acquired from the space in non-equilibrium state. Since the non-equilibrium state is continuously maintained by an externally supplied heat, energy can be constantly obtained. The value of the energy is determined by the kinetic energy of electrons. This is the result obtained by the experiments according to the simultaneous theory.

Replacement for the paragraph beginning at page 26, line 22:

However, in some places, a larger amount of water evaporates and at some places such as an entrance of a river, a larger amounts of water enters the sea. From these kinds of non-equilibrium state, that is, places having low simultaneous probability, energy can be obtained. Most of hydroelectric power plants are installed where water inflows into the seawater. Energy can be continuously obtained until an external and thermal energy is supplied and al long as non-equilibrium state is maintained. At this time, the amount of energy is determined by a potential energy of water. The size and installing scale of the hydroelectric power plant are determined by the amount of water. That is, an actor and a funcor (installing scale of the plant) in a spacor are appropriately realized.

Replacement for the paragraph beginning at page 32, line 2:

When neighboring spaces A and B have a water level difference, the water in space A does not occupy space B at the same time. When a temperature difference is present between spaces A and B, the temperature of space A do not affect the temperature in space B at the same time. It is believed that energy can be obtained from the water level difference or the temperature difference. At this time, the simultaneous probability of the water level or temperature of spaces A and B is zero (0/1). The states of spaces A and B are liable to change according to time and energy can be obtained from a space having the simultaneous probability of zero (0/1). Thus,

concept utilized in the second law of thermodynamics can be reasonably adopted by the simultaneous theory without any conflict.

Replacement for the paragraph beginning at page 35, line 11:

(1) A barrier layer such as water, various conducting solvent and electrolyte, a resistor, conductive plastic or a tunneling effect layer is formed on a plate of a collecting electrode. (2) Minute metal particles which have an excellent rectifying characteristic with a semiconductor and a uniformed size, as determined by an electron energy, are uniformly distributed on the barrier layer in high density. (3) A semiconductor layer having the same density with the metal particles and contacting the minute metal particles is formed. Preferably, P-type semiconductor in which only acceptors are present or N-type semiconductor in which only donors are present is utilized. Materials having a large density difference between two kinds of carriers can also be preferably utilized. (4) An ohmic layer is formed on the semiconductor layer. (5) A metal plate contacting the ohmic layer is formed. These basic structures can be modified in diverse manners.

Replacement for the paragraph beginning at page 36, line 18:

A semiconductor sample (28mm x 8mm x 4mm) of a eutectic body of Cu_2S-CuS-Ag_2S was prepared. One surface of the sample was ground to form a mirror shape and a semiconductor layer 36 is formed. The ground surface was ground by means of a copper bar and rubbed by means of a paper to heat the surface. The other surface of the sample was fixed onto a metal plate 32 (stainless steel) by utilizing an adhesive 34 (silver paste). An aluminum plate having a thickness of 0.2mm was cut to form about 20 angle to form a tip. The tip was heated to form an aluminum oxide layer on the surface of the tip and to obtain an aluminum needle 38. The tip was fixed onto the mirror surface and metal plate 32 is connected to a detecting apparatus 50 through a shield cable 40.

Replacement for the paragraph beginning at page 37, line 15:

The voltmeter was connected again. Voltage was lowered and the value was several mV. At this time, no mark was found at the contacting point of the mirror surface and aluminum needle 38. The above-described experiment was implemented at an ambient condition.

Replacement for the paragraph beginning at page 38, line 4:

An Si sample (28mm x 8mm x 4mm) was prepared and platinum (Pt) minute particles were rubbed to manufacture a rectifier. After observing for 2 years, the present inventor concluded the followings. The minute metal electrode was not consumed (as a chemical battery) and the voltage difference was observed by humidity. The decrease of the current values according to time was due to an oxide layer on the surface of the Si sample. When an oxide layer is between the minute metal electrode and the Si surface, the same result was obtained. This experiment was implemented at an ambient condition.

Replacement for the paragraph beginning at page 38, line 19:

The number of the minute particles was decreased and reached to an optimized number to give the highest voltage value. Then, the voltage was decreased according to the decrease of the number of the minute particles. After supplying the current, the voltage was decreased and then recovered. This implied that the result was affected by humidity and characteristics of chemical battery.

Replacement for the paragraph beginning at page 41, line 6:

Practically, a lot of particles are present and the phases and vibration periods of the particles are respectively independent. These electrons are guided into one direction in the present invention. When the metal particles and the metal surface are one body, this effect cannot be obtained.

CLAIMS (with indication of amended or new):

1. (AMENDED) An apparatus, comprising:

a collector electrode of conductive material; a first charge movement barrier layer electrically contacted with said collector electrode;

a nano-particles layer in which a plurality of conductive and of a predetermined minute size, nano-particles that are insulated from each other, and arranged as a mono layer and have electrical contact said first charge movement barrier layer;

a first semiconductor layer contacted with said nano-particles through a medium of a rectifying barrier of a predetermined depth; and

a source electrode of conductive material electrically contacted with said first semiconductor layer,

wherein a plurality of nano-sized rectifying devices formed by said first nano-particles layer and said first semiconductor layer have electrical connections in parallel with said collector electrode through said first charge movement barrier, each of said rectifying devices serving as an electrically dependent rectifying device, and

wherein by means of unit charges (1.602×10^{-19}C) coming in and out said nano-particles and confined by a barrier, and generating irregular AC potential by heat on respective said nano-particles, ambient temperature of said apparatus in a thermal equilibrium state is converted by itself so that said apparatus continuously produces DC electromotive force.

2. (AMENDED) The apparatus of claim 1, wherein said collector electrode, said source electrode and said nano-particles are made of metal or its equivalent material, respectively.

3. (AMENDED) The apparatus of claim 1, wherein said first semiconductor layer is a P-type semiconductor.

4. (NEW) The apparatus of claim 1, wherein said semiconductor layer is an N-type semiconductor.

5. (NEW) The apparatus of claim 1, further comprising a second nano-particles layer equivalent with said first nano-particles layer and a second semiconductor layer having a carrier type opposite to that of said first semiconductor layer and inserted between said first charge movement barrier layer and said collector electrode, so that said apparatus has P-type and

N-type conductive structures sharing said first charge movement barrier layer, connected serially with each other, and between said collector electrode and said source electrode.

6. (NEW) The apparatus of claim 1, further comprising a second semiconductor layer having a carrier type is opposite to that of said first semiconductor layer and inserted between said first charge movement barrier layer and said collector electrode, so that said apparatus has P-type and N-type conductive structures which shares said first nano-particles layer and are connected serially with each other.

7. (NEW) The apparatus of claim 1, further comprising an ohmic layer between said first semiconductor layer and said source electrode.

8. (NEW) The apparatus of claim 1, wherein said first charge movement barrier layer is made from material capable of providing tunneling effect or resistor material so as to prevent said plurality of nano-particles from having direct electrical connections with each others through said collector electrode.

9. (NEW) The apparatus of claim 1, wherein said first charge movement barrier layer has incomplete conductive state with both a barrier property and a conduction property, said barrier property preventing said plurality of nano-particles from having direct electrical connections with each other through said collector electrode and attributing to generation of the irregular AC potential on respective nano-particles which the unit charge comes in and out, and said conduction property allowing said rectifying devices to have electrical connections in parallel with said collector electrode through said first charge movement barrier.

10. (NEW) A method of obtaining a desired DC electromotive force, by using said apparatus of claim 1, and by allowing, at an ambient temperature of said apparatus, among unit charges, only the unit charges with such high energy by which they can go over a barrier determined by carrier density of said first semiconductor layer, size (being able to be represented

Cont'd. as area S) of said nano-particles, depth L1 of said charge movement barrier layer, and depth L2 of said rectifying barriers, so as to generate irregular AC potential on said nano-particles.

APPENDIX B
VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

SPECIFICATION:

Replacement for the paragraph beginning at page 4, line 22:

There's no prior art in this field, and the accomplishment of the present invention contradicts the second law of [of] thermodynamics. It is anticipated that very few scholars in the field will deny the second law of thermodynamics.

Replacement for the paragraph beginning at page 8, line 8:

6. In a battery having one electrode made of copper plate coated with copper sulfide, the other electrode made of copper plate and an electrolyte of copper(II) sulfate, the copper plate becomes positive(+) electrode. Copper is precipitated during discharging and copper particles grow on the negative electrode at the portion where the copper plate is exposed, without a supply of external power. After implementing various methods, it was found that the surface of copper sulfide is positive(+) electrode and an inner portion of copper sulfide contacting the copper plate is a generator of a negative electrode and the copper plate of the negative electrode is a mere metal plate contacting the generator. The electrolysis of copper at both electrodes [are] <u>is</u> implemented by the electromotive power outputted from the generator. The present inventor found that the outputted energy was originated from the rectifying phenomenon of thermally moving electrons. By utilizing this apparatus, a temperature drop at the portion where the electromotive force was generated, could be detected. Further, the conversion of heat of an object into electric energy by the rectifying method utilizing the thermally moving electrons can be verified.

Replacement for the paragraph beginning at page 9, line 20:

The relationship of the electromotive force to the size of the metal particles and the problem of non-reproductiveness of the voltage value were solved only in the electrolyte and water. Although some problems of interference of the chemical electromotive force occur for

these cases, the relationship of the size of the minute metal particles to the amount of the current can be obtained. In addition, the size of the metal particles can be controlled while reading the values of the electromotive force. There's other various advantages accompanying the experiments in the electrolyte or water. Different from the experiments implemented in the vacuum or under atmosphere, the electrolyte or water becomes a barrier layer in this [experiments] experiment.

Replacement for the paragraph beginning at page 11, line 6:

The copper sulfide electrode was replaced with an electrolyte manufactured by the following method. Cu was deposited in a vacuum on the surface of Ta metal plate. Then, thus obtained metal plate was immersed into an aqueous $CuSO_4$ solution for electroplating copper onto the surface to obtain about 0.02mm thick copper layer. After rinsing with water, the copper coated plate was impregnated with $(NH_4)_2S_x$ solution for 5 minutes to change copper into copper sulfide. Thus obtained sample was replaced with the copper sulfide electrode of the previously described battery. As a result, almost similar value of the electromotive force was obtained. When copper sulfide was employed as an anode and an electroplating with a relatively low current of $50mA/12cm^2$ for 60 seconds was carried out to form minute metal particles on the surface of copper sulfide, the voltage increased. Various experiments utilizing this battery [was] were implemented as follows. A reverse current was provided to extinguish the metal particles.

Replacement for the paragraph beginning at page 16, line 14:

1. Even though a surface of water of an isolated lake makes rippling waves, mean water level of the lake is considered to be same and the lake is considered to be in equilibrium. Through the whole lake, the amount of water above an absolute [horizonal] horizontal plane and that below the absolute horizontal plane are same and the water above and below the horizontal plane are in equilibrium. When a molecule of water ascends above the horizontal plane, another molecule of water descends below the horizontal plane at some other place in the lake. Thus, the water level is kept constant. However, when the surface is divided and observed, and a surface having a peak of the wave is observed, a heap of water ascends without having the same amount of water descend in this divided area. That is, the peak and trough of a wave are not always

present in one space. This space has simultaneous probability of zero (0/1). Even though the lake is collectively in equilibrium, a local portion which is not in equilibrium is present. When the space of the local portion is enlarged, this portion approaches to the equilibrium state.

Replacement for the paragraph beginning at page 17, line 6:

2. A seawater level on the earth has a constant mean water level because the amount of water evaporating and precipitating [are] is the same. When the seawater keeps the mean water level, the two amounts are the same and the state of equilibrium is maintained. However, at some places, the amount of water evaporated is larger and at some places, a heavy rainfall pours. At an entrance of a river, a large amount of water inflows. That is, even though the seawater is collectively in equilibrium, each portions are not in equilibrium.

Replacement for the paragraph beginning at page 18, line 6:

For example, when a metal and a semiconductor contact to form a rectifying surface and a voltage is not applied, an exchange of electrons occurs only for an instant and an equilibrium state is achieved after metal and semiconductor establish Fermi level. At this time, the number of electrons coming in and out of the rectifying surface [are] is the same and no resulting voltage change is obtained. The voltage between two terminals of the boundary surface is called a contacting electricity which is generated by both materials and not discharged. This rectifying surface is in equilibrium and does no work with respect to an external system.

Replacement for the paragraph beginning at page 19, line 14:

Thus, when indefinite amount of particles are present in a space, the simultaneous theory and the second law of thermodynamics render the same result. However, when the number of particles present in the space is limited, the simultaneous theory and the second law of thermodynamics give completely different result. Accordingly, the one which closely [correspond] corresponds to the actual reality gives an accurate result. When the rectifying surface is large and [unlimited number of] countless free carriers are present at the surface, the system is in equilibrium by both theories.

Replacement for the paragraph beginning at page 22, line 4:

It is difficult to describe the operational principle of the rectifying surface. The above-described phenomenon is obtained when there [is] are a small number of electrons.

Replacement for the paragraph beginning at page 24, line 21:

When the simultaneous theory is supposed to be true, an irregular alternating potential is generated by electrons entering and exiting a minute rectifying surface. This generation is originated from the kinetic energy of electrons by heat. The rectifying phenomenon is accomplished when the rectifying condition is satisfied. The rectifying phenomenon occurs when there is a difference of electrons entering and exiting the rectifying surface which is caused by a heightened barrier by an externally applied voltage and a low barrier of forward direction. The rectifying condition is an externally applied voltage. When a minute rectifying surface is allowed, a current amount will be very weak. A plurality of minute rectifying surfaces arranged in parallel will give the same effect with a rectifying surface having one large area. At this time, the rectifying phenomenon of the thermally moving electrons does not occur by the simultaneous theory. However, when minute metal particles are dispersed on a surface of a semiconductor, and when each particle is electrically insulated, each particle maintains its own independent rectifying reaction. A number of metal rectifying particles are connected with a collecting metal surface with a [tunnelling] tunneling effect layer (in the experiments, tantalum oxide layer, aluminum oxide layer or water was utilized) between them. Then, the particles are combined in parallel to accomplish a large rectifying surface of which rectifying condition by the simultaneous theory is satisfied. The minute metal particles have irregular phases and periods. However, the rectifying direction of the semiconductor and the metal particles are the same. Thus, an effective rectifying reaction is implemented and about 20 Amperes per cm^2 or above of current could be obtained with rough experimental apparatuses. The resistance of the semiconductor has been disregarded. The collecting metal surface contacts the semiconductor where the metal particles are not present with the [tunnelling] tunneling effect layer between them. However, no discharging occurs because a reverse direction is obtained with respect to the semiconductor owing to the rectifying structure.

Replacement for the paragraph beginning at page 26, line 5:

As described above, when the rectifying surface is divided into minute regions, an aggregate of minute rectifying surfaces in non-equilibrium state is obtained. The minute rectifying [surface] surfaces have the simultaneous probability of zero (0/1). When independent rectifying apparatus is installed for each rectifying surfaces, energy can be acquired from the space in non-equilibrium state. Since the non-equilibrium state is continuously maintained by an externally supplied heat, energy can be constantly obtained. The value of the energy is determined by the kinetic energy of electrons. This is the result obtained by the experiments according to the simultaneous theory.

Replacement for the paragraph beginning at page 26, line 22:

However, in some places, a larger [amounts] amount of water evaporates and at some places such as an entrance of a river, a larger amounts of water enters the sea. From these kinds of non-equilibrium state, that is, places having low simultaneous probability, energy can be obtained. Most of hydroelectric power plants are installed where water inflows into the seawater. Energy can be continuously obtained until an external and thermal energy is supplied and al long as non-equilibrium state is maintained. At this time, the amount of energy is determined by a potential energy of water. The size and installing scale of the hydroelectric power plant are determined by the amount of water. That is, an actor and a funcor (installing scale of the plant) in a spacor are appropriately realized.

Replacement for the paragraph beginning at page 32, line 2:

When neighboring spaces A and B have a water level difference, the water in space A [do] does not occupy space B at the same time. When a temperature difference is present between spaces A and B, the temperature of space A do not affect the temperature in space B at the same time. It is believed that energy can be obtained from the water level difference or the temperature difference. At this time, the simultaneous probability of the water level or temperature of spaces A and B is zero (0/1). The states of spaces A and B [is] are liable to change according to time and energy can be obtained from a space having the simultaneous probability

of zero (0/1). Thus, concept utilized in the second law of thermodynamics can be reasonably adopted by the simultaneous theory without any conflict.

Replacement for the paragraph beginning at page 35, line 11:

(1) A barrier layer such as water, various conducting solvent and electrolyte, a resistor, conductive plastic or a [tunnelling] tunneling effect layer is formed on a plate of a collecting electrode. (2) Minute metal particles which [has] have an excellent rectifying characteristic with a semiconductor and a uniformed size, as determined by an electron energy, are uniformly distributed on the barrier layer in high density. (3) A semiconductor layer having the same density with the metal particles and contacting the minute metal particles is formed. Preferably, P-type semiconductor in which only acceptors are present or N-type semiconductor in which only donors are present is utilized. Materials having a large density difference between two kinds of carriers can also be preferably utilized. (4) An ohmic layer is formed on the semiconductor layer. (5) A metal plate contacting the ohmic layer is formed. These basic [structure] structures can be modified in diverse manners.

Replacement for the paragraph beginning at page 36, line 18:

A semiconductor sample (28mm x 8mm x 4mm) of a eutectic body of Cu_2S-CuS-Ag_2S was prepared. One surface of the sample was ground to form a mirror shape and a semiconductor layer 36 is formed. The ground surface was ground by means of a copper bar and rubbed by means of a paper to heat the surface. The other surface of the sample was fixed onto a metal plate 32 (stainless steel) by utilizing an adhesive 34 (silver paste). An aluminum plate having a thickness of 0.2mm was cut to form about 20 angle to form a tip. The [the] tip was heated to form an aluminum oxide layer on the surface of the tip and to obtain an aluminum needle 38. The tip was fixed onto the mirror surface and metal plate 32 is connected to a detecting apparatus 50 through a shield cable 40.

Replacement for the paragraph beginning at page 37, line 15:

The voltmeter was connected again. Voltage was lowered and the value was several mV. At this time, no mark was found at the contacting point of the mirror surface and aluminum

needle 38. The above-described experiment was implemented at an ambient [conditions] condition.

Replacement for the paragraph beginning at page 38, line 4:

An Si sample (28mm x 8mm x 4mm) was prepared and platinum (Pt) minute particles were rubbed to manufacture a rectifier. After observing for 2 years, the present inventor concluded the followings. The minute metal electrode was not consumed (as a chemical battery) and the voltage difference was observed by humidity. The decrease of the current values according to time was due to an oxide layer on the surface of the Si sample. When an oxide layer is between the minute metal electrode and the Si surface, the same result was obtained. This experiment was implemented at an ambient [conditions] condition.

Replacement for the paragraph beginning at page 38, line 19:

The number of the minute particles [were] was decreased and reached to an optimized number to give the highest voltage value. Then, the voltage was decreased according to the decrease of the number of the minute particles. After supplying the current, the voltage was decreased and then recovered. This implied that the result was affected by humidity and characteristics of chemical battery.

Replacement for the paragraph beginning at page 41, line 6:

Practically, [the number] a lot of particles are present and the phases and vibration periods of the particles are respectively independent. These electrons are guided into one direction in the present invention. When the metal particles and the metal surface are one body, this effect cannot be obtained.

CLAIMS:

1. (AMENDED) [A rectifier of thermally moving electrons comprising:
   a first metal layer;
   an electron movement barrier layer contacting said first metal layer;

a dispersed layer of minute metal particles in which said particles are uniformly dispersed, said dispersed layer contacting with said electron movement barrier layer;

a semiconductor layer contacting with said dispersed layer of minute metal particles;

an ohmic layer contacting with said semiconductor layer; and

a second metal layer contacting with said ohmic layer, said second metal layer being comprised of an aggregate of minute rectifying surfaces.]

An apparatus, comprising:

a collector electrode of conductive material; a first charge movement barrier layer electrically contacted with said collector electrode;

a nano-particles layer in which a plurality of conductive and of a predetermined minute size, nano-particles that are insulated from each other, are arranged as a mono layer and have electrical contact said first charge movement barrier layer;

a first semiconductor layer contacted with said nano-particles through a medium of a rectifying barrier of a predetermined depth; and

a source electrode of conductive material electrically contacted with said first semiconductor layer,

wherein a plurality of nano-sized rectifying devices formed by said first nano-particles layer and said first semiconductor layer have electrical connections in parallel with said collector electrode through said first charge movement barrier, each of said rectifying devices serving as an electrically dependent rectifying device, and

wherein by means of unit charges (1.602×10^{-19}C) coming in and out said nano-particles and confined by a barrier, and generating irregular AC potential by heat on respective said nano-particles, an ambient temperature of said apparatus in a thermal equilibrium state is converted by itself so that said apparatus continuously produces DC electromotive force.

2. (AMENDED) [A rectifier of thermally moving electrons comprising minute rectifying surfaces having same rectifying direction, said rectifying surfaces being electrically insulated from each other, and said rectifying surfaces are in incomplete conductive state (barrier state) with one collimating electrode.]

The apparatus of claim 1, wherein said collector electrode, said source electrode and said nano-particles are made of metal or its equivalent material, respectively.

3. (AMENDED) [A method for converting thermal energy into electric energy by rectifying thermally moving electrons by utilizing a rectifier of thermally moving electrons.]

The apparatus of claim 1, wherein said first semiconductor layer is a P-type semiconductor.